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Regional Consultation on Animal Feed
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PROMOTION OF THE USE OF LOCAL AGRICULTURAL AND INDUSTRIAL RAW MATERIALS, BY-PRODUCTS AND WASTES, INCLUDING RESEARCH AND INFORMATION ON THE COMPOSITION, MODALITIES OF UTILIZATION AND PROCESSING REQUIREMENTS AS WELL AS QUALITY CONTROL AND DEVELOPMENT OF REGIONAL COOPERATION

Issue Paper 1*

Prepared by

the UNIDO Secretariat

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I. Farm animals and mankind

1. Throughout history animals have always had great influence on human life. From the early days of hunting through later periods of taming and domestication, they have been a source of food and clothing. Some animals even became partners to men in their working life and helped to provide mobility and transport. Little has changed to the present day in the human/animal relationship and in many communities, animals are still the backbone of man's existence and the basis of wellbeing and even wealth.

2. However, the overall human environment and life style has changed drastically. The human population has grown immensely with consequent pressure to procure more food. Agricultural land has become scarce and harvests can only be kept high by chemical fertilization and selection and/or modification of agricultural grains and fruits. Thus less space and food remain for the animals; in some instances man and farm animals have to compete for land and food.

3. To overcome this difficulty, the long-practised traditional methods of feeding animals namely, by using pasture land and/or cultivating large quantities of feed grains and feed plants, have to be reduced to a minimum and other non-traditional ways of feeding farm animals have to be found, as for example, through the utilization of agro-industrial by-products and residues resulting from many agro-industrial production plants.

4. Many such individual by-products and residues may not meet the nutritional requirements and will therefore have to be appropriately fortified, blended, and compounded, to render them a valuable feed component.

Considerations

5. Over the last few decades, the animal feed industry in developed countries has become a decisive factor in the production and supply of animal based human food. The situation in most of the developing countries is certainly different from that of industrialized countries. The contrast is particularly striking in the case of the African Region where the industrial production of animal feed compounds still receives a rather low level of importance compared with other branches of the agro-based industry.

6. Consequently, the Consultation will certainly wish to consider ways and means by which the animal feed industry for the African Region can most benefit, especially through the utilization of agro-industrial by-products and residues as animal feed ingredients.

II. Agricultural products, by-products and residues

7. Agricultural crops such as sorghum, millet, barley, lucerne, feed maize, cassava and others, are at present still the most

important animal feed raw materials. As mentioned, given the pressure on agricultural land and the ever increasing human need for food, every attempt has to be made to reduce the overall quantity of agricultural crops to be consumed as animal feed and to replace them gradually with agricultural and agro-industrial by-products and residues.

8. Agricultural by-products and post harvest residues are manyfold and most of them are suitable for use as animal feed ingredients. Examples are whole cotton seed kernels from small gins not equipped to separate the seed from the lints, groundnut post harvest residues, browse from leguminous trees and plants, corn cobs, straw, and sugar cane tops and sugar cane as such. Also abundant quantities of roughage (straw, etc.) available from agriculture can be fed to ruminants as a necessary feed component. This will even help solve the problem of roughage disposal.

III. Agro-industrial by-products and residues

9. By-products from the vegetable oil industry, of which there are a great variety, are very important compound feed ingredients. Oil cakes and extracted meal are one of the few animal feed ingredients which do not normally require secondary processing operations (de-hydration etc.) if appropriately produced in the vegetable oil factory. Oil cakes resulting from the mechanical pressing process and the extracted meal from relevant solvent extraction operations, have a high content of energy and protein. Among these are oil cakes/meal from groundnuts, sunflower, cottonseed, karité, palmkernels, sesame, beniseed, copra and melon seed. Another valuable protein animal feed ingredient is doubtlessly soya bean meal with its well balanced essential amino acid composition.

10. Next to protein oil cakes from the vegetable oil industry, bran and other residues from the flour milling industry are important raw feed materials. In many developing countries large wheat milling plants are in operation producing high quantities of wheat bran. Instead of being sold to animal farms for direct feeding purposes, bran material should become a carbohydrate raw material component for the production of feed compounds. The same applies to maize bran as well as to the milling residues of sorghum and other milling operations.

11. The rice milling industry produces considerable quantities of rice bran which is only utilized to a very small extent as a carbohydrate component for the production of compound feed. Rice bran very quickly develops fatty acids caused by an enzymatic splitting process of the oil contained therein and becomes rancid. This problem can, however, be avoided by adding stabilization units to the rice milling process in order to avoid rancidity and quality deterioration of the rice bran material. In addition technological improvement would be needed in many small- and medium-scale rice mills in order to produce quality bran, not as a rice milling residue, but as a valuable raw material for the production of compound animal feed. This points

bran, not as a rice milling residue, but as a valuable raw material for the production of compound animal feed. This points to an important agro-industrial development in which UNIDO can play a very useful part.

12. Considerable quantities of spent grains from the beer brewing industry could be a very valuable raw material for the production of animal feed compounds. Only a very small percentage of spent brewery grains are, however, utilized at present for this purpose. These grains are mostly sold wet and unprocessed to animal farms. In order to turn the spent grains into a raw material for the animal feed industry they have to be dehydrated. However, hardly any brewery is able or willing to do so and spent grains remain a low value residue/waste material. Again improvement action is needed in view of the revalidation of a waste material to transform it into a raw material of value for the animal feed industry.

13. A very high percentage of the fish catch such as skins, heads, tails, intestines, bones, etc. goes to waste during fish processing operations. These waste products represent a high value protein raw material for the production of animal feed compounds which can be converted into fish meal by relatively simple processing operations. Such a conversion would not only provide valuable animal feed raw material but also help to solve an environmental problem. Once again, improvement action is called for by policy-makers, industrialists and all concerned and interested in the industrial production of compound feed and the overall industrial development which goes with it.

14. There are other agro-industrial by-products and residues which call for similar action such as the utilization of fruit and vegetable processing residues, slaughterhouse residues, molasses from the sugar industry and others depending on the situation and the structure and operations of existing agro-based industries. Opportunities will have to be identified in order to take relevant action on a case-by-case basis.

Considerations

15. From the situation as illustrated in chapters II and III of this paper, it transpires that considerable quantities of agro-industrial by-products and agricultural residues are available as raw materials for the production of animal feed compounds. However, the majority of them have either to be produced in better quality by the food factory - thereby necessitating technical modifications in the production process (rice bran) - or they have to undergo additional preparatory processing operations, the most important of which is dehydration (as for example spent brewery grains). In this context the question arises: who is to undertake such preparatory processing operations? The producer or the user or perhaps a third party? Is there a role for governments to provide tax and/or other incentives?

IV. An important factor in agro-industrial development

16. The effective utilization of agro-industrial by-products and wastes as raw materials for the production of quality animal feed compounds is also bound to have a positive influence on those branches of the agro-based industry which produce them along with the main product. By becoming raw materials for the production of animal feed compounds, these low value by-products and residues of human food production will receive an added value which will be reflected in an additional income. The potential benefit will affect both the food producer and the feed producer, and the animal feed industry to be created and/or developed may stimulate agro-industrial development.

17. In some cases, the viability of an agro-industry depends on its ability to find a market for its by-products and residues. An illustrative example is the oilseed processing industry which has to sell its main product - the vegetable oil - and its by-product - the oil cakes - in order to make its production feasible. In a number of developing countries the establishment of vegetable oil factories did not prove feasible because there was a high demand for vegetable oil but no local market for the oil cakes. No animal feed factory existed which could have used oil cakes as essential protein animal feed raw material.

Considerations

18. The Consultation may wish to discuss the economic viability of using industrial by-products for the production of animal feed as well as other measures, and especially the economic benefits in terms of increased income and employment opportunities arising therefrom.

V. Animal feed raw materials

19. The raw material for the production of compound feed may be divided into three groups, namely roughage, concentrates and supplements.

20. Roughage is, in principle, fibrous material which is essential for feeding ruminants but also important for other animals whose digestive system requires a certain amount of roughage. The roughage content of ready-for-use animal feed varies depending on the type and age of the animals to be fed.

21. Concentrates are the actual suppliers of protein and energy to the animal. They are the substances which affect the overall life of the animal, namely, protein for cell restructuring and growth and energy for the activities of life and functioning of the various body and mental actions. The amount of energy and protein needed depends on the type of animal to be fed, its age and the purpose for which it is kept (laying hens or meat chicken, milking cows or meat cattle, etc.).

22. Supplements consist of vitamins and minerals which are essential for a healthy and active animal. Supplements may further be needed for the improvement of the essential amino-acid composition of the protein supplies and other nutritional corrections.

23. Animal feed raw materials (by-products and residues) have to be selected and blended for quality and quantity in order to form a well composed final feed product. The point, therefore, is to find, select, prepare and proportionally use available ingredients for this purpose.

VI. Feed formulation (the feed composition)

24. The term "scientific feeding" has been created to reflect the appropriate formulation of animal feed. The aim of scientific feeding of farm animals is to obtain optimum yields of milk, eggs or meat by feeding appropriate quantities of feedstuff formulated to provide the correct quantity and proportions of carbohydrates, protein, vitamins and minerals to the animal.

25. Feed formulation, therefore, requires in-depth knowledge of animal digestion and the digestibility of feedstuff. This knowledge is available, and relevant publications can be obtained from competent sources.

26. The animal feed producer must, however, know what types of animal and what age are to be fed with his feed product. He has further to know the criteria and composition of the feed raw materials which he wishes to use in his production process in order to obtain the appropriate mixtures.

27. Feed formulation, therefore, has to be based on relevant research and chemical analyses. In addition to relevant feed formulation information, the feed producer also has to obtain detailed information from the market (animal holding systems) he wishes to supply with quality feed compounds.

Considerations

28. The Consultation may wish to consider the most appropriate means by which the animal feed industry in developing countries can have access to relevant research regarding feed formulation.

VII. Information requirements

29. As can be seen in chapters II to VI above, the need for information becomes evident. This is not merely information on feed raw materials, feed formulation and research results, but also information on quality controls, technology, finance, economy and all aspects of production and utilization of compound animal feed. Relevant information material will, therefore, have to be collected, registered and stored by concerned institutes for common use. The availability of information to all

interested parties is one of the pre-conditions for appropriate animal feed industry development.

30. In addition to general information material, specific advice may also have to be provided to producers and users of animal feed compounds and to the producers and processors of animal feed raw materials. All concerned and interested may be given the opportunity to ask questions to competent sources on individual information problems.

Considerations

31. For most small-scale compound feed producers and users in the region it may be extremely difficult, if not impossible, to obtain the information required for making decisions. Appropriate information channels are not commonly known and communication may be time-consuming and costly.

32. It may be possible to solve these problems through the creation of Information Centres which could collect, register and distribute relevant information on all aspects of animal feed production and utilization. These Centres might further have an additional advisory function in order to provide answers to specific individual questions which cannot normally be found in the literature.

VIII. Regional cooperation

33. Regional cooperation is particularly relevant to the animal feed industry. The structure of the agro-based industry is different from country to country and the by-products and residues to be made available as animal feed raw materials are unevenly distributed. While one country may be in a position to supply substantial quantities of oil cakes another country may become the main supplier of cassava chips or rice bran or wheat bran, while a third with a developed sugar industry may become the main supplier of molasses. The feed raw materials available in only one country may not be sufficient to support the establishment of animal feed production plants and only regional raw material supplies may facilitate the production of well formulated animal feed products.

34. The situation is very similar from the marketing point of view of animal feed compounds. In one country, ruminants (sheep, cattle, camels, etc.) may dominate the feed market, in another, the feed market may largely depend on pigs and in a third, poultry may be the largest feed consumer. The reasons for such specialization may be of a religious nature but may also be caused by the traditional eating habits of the population. The animal feed industry will have to meet all these market requirements and depending on available feed ingredients it will be in a position to specialize in the production of specific feed products with only a few possible modifications in feed formulation and, therefore, least cost production. Only regional cooperation can bring about such an industrially beneficial situation.

Considerations

35. The Consultation may wish to consider existing or future barriers to regional cooperation and may wish to propose appropriate ways of removing them.

IX. Research activities, feeding experiments and quality control

36. A developing animal feed industry opens the gate for a wide field of applied research operations. Many non-traditional and as yet unexploited animal feed raw materials exist waiting for industrial utilization. UNIDO, for example, has developed a new detoxification technology for castor bean meal which has made this normally toxic by-product of the castor oil industry a very valuable animal feed ingredient. Applied research activities have also led to the utilization of rubberseed cakes for the production of animal feed as well as the lalobe kernel (Balanites aegyptiaca) extraction residues which can be made available from all over the Sahel Zone. Coffee plant residues still require research as do banana post harvest residues, a considerable number of local oil palm fruits and various oil seed not commonly known and traded.

37. Chemical and nutritional research, however, is not the only way and not really sufficient for the utilization of animal feed ingredients so far unutilized. Research results have to be confirmed by sound animal feeding experiments. Only the results of animal feeding tests can give practical answers to the question of the suitability and effectiveness of non-traditionally-composed animal feed compounds and the feeding efficiency and economy derived therefrom.

38. Regular continuous quality controls are unavoidable in the animal feed industry. The feed raw materials have to be analysed in order to define their composition as the expected supplier of protein, energy, minerals, etc.. The final feed product has to undergo intermediate and final quality controls so as to ensure maintenance composition and nutritional value. Quality controls are particularly important if a brand name is to be created and maintained on the market. Issue Paper No. 2 refers.

Considerations

39. Extensive scientific and applied research has been carried out in industrialized countries in the animal feed production sector which has laid the basis for the formulation, production and optimum utilization of animal feed compounds. The information resulting therefrom is available world-wide. Nevertheless, there is a need for research in developing countries particularly with regard to unutilized or under-utilized local animal feed ingredients which are abundantly available but whose feed value has not yet been recognized.

40. The Consultation may, therefore, wish to consider the importance of new research programmes and the intensification and expansion of national and regional research activities in the animal feed production sector.

X. The utilization of animal feed

41. Compound animal feed is relatively expensive. Its utilization, therefore, requires the application of special feeding techniques by the feeder in order to meet the economic requirements. Careful rationing is necessary as well as timely and correct feeding. The daily number of meals offered to the animal has to be well considered from a more scientific-economic rather than a practical point of view.

42. In this context the question may arise whether the production and utilization of animal feed compounds is also suitable and profitable in developing countries. The answer is positive but in connection with organized animal raising and holding systems. The use of compound feed in animals feeding in the traditional way on the open land, is certainly not useful and will soon prove to be inefficient and uneconomic. The production and utilization of compound feed is best undertaken with the establishment of suitable "industrial" ranching systems. These systems need to be well organized and controlled in all aspects such as animal housing, hygiene, health controls, manure disposal, as well as appropriate feeding with nutritionally tailored feed compounds.

Considerations

43. The Consultation may wish to discuss the conditions under which increased use of compound animal feed is beneficial and the measures to promote its consumption.